



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/091,437	03/07/2002	Masaru Kuramoto	8013-1006	9452

466 7590 12/04/2003

YOUNG & THOMPSON  
745 SOUTH 23RD STREET 2ND FLOOR  
ARLINGTON, VA 22202

EXAMINER

SOWARD, IDA M

ART UNIT	PAPER NUMBER
----------	--------------

2822

DATE MAILED: 12/04/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

10/091,437

Applicant(s)

KURAMOTO ET AL.

Examiner

Ida M Soward

Art Unit

2822

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 11 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 18-57 is/are pending in the application.
- 4a) Of the above claim(s) 18-23 and 38-57 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 24-29 and 31-36 is/are rejected.
- 7) ☒ Claim(s) 30 and 37 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 March 2002 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. §§ 119 and 120

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).  
a) ☒ All b) ☐ Some \* c) ☐ None of:  
1. ☒ Certified copies of the priority documents have been received.  
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.  
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).  
\* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.  
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 3. 6) ☐ Other: \_\_\_\_\_

## **DETAILED ACTION**

This Office Action is in response to the election filed September 11, 2003.

### ***Election/Restrictions***

Applicant's election with traverse of claims 24-37 in Paper No. 12 is acknowledged. The traversal is on the ground(s) that claim 18 is readable on the elected embodiment. This is not found persuasive because claim 18 is a Group III-V compound semiconductor epitaxial layer and elected claims 24-37 are a semiconductor layered structure.

The requirement is still deemed proper and is therefore made FINAL.

### ***Priority***

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Drawings***

The drawings are objected to under 37 CFR 1.83(a) because they fail to show the width of the mask at its lower level as described in the specification and the facet structure (page 10, lines 1-7). Any structural detail that is essential for a proper understanding of the disclosed invention should be shown in the drawing. MPEP § 608.02(d). A proposed drawing correction or corrected drawings are required in reply to

the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claim 24 is rejected under 35 U.S.C. 102(e) as being anticipated by Tadatomo et al. (US 6,225,650 B1).

Tadatomo et al. teach a semiconductor layered structure comprising: a base material 1 having a crystal structure; a mask 2 over the base material, and the mask having at least one opening further defining at least a growth area of a surface of the base material; and a Group III-V compound semiconductor epitaxial layer 3 being directly on the at least growth area and the Group III-V compound semiconductor epitaxial layer completely burying the mask, wherein the Group III-V compound semiconductor epitaxial layer includes dislocations L which extend substantially parallel to a thickness direction of the Group III-V compound semiconductor epitaxial layer, and at a facet face of a facet structure of the Group III-V compound semiconductor epitaxial layer, the dislocation turn substantially perpendicular to the thickness direction and are

Art Unit: 2822

terminated by the side walls of the mask (Figures 4 and 12(c), cols. 5 and 10, lines 21-33 and 52-60, respectively).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 25, 27, 31-32 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tadatomo et al. (US 6,225,650 B1).

Tadatomo et al. teach all mentioned in the rejection above. However, Tadatomo et al. fail to explicitly teach the thickness of the mask being greater than or equal to the opening width of the mask at its lower level divided by two and that quantity multiplied by the tangent of the base angle of the facet structure. Tadatomo et al. teach an opening width A, a thickness of the mask being less than  $7\mu\text{m}$  and a base angle. Where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation, *In re Aller*, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955) (MPEP § 2144.05 [IIA]). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to provide the thickness of the mask being greater than or equal to the opening width of the mask at its lower level divided by two and that quantity multiplied

Art Unit: 2822

by the tangent of the base angle of the facet structure to have less reduction of dislocation density of the GaN crystal (cols. 1 and 6, lines 9-18).

Claims 26 and 33 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tadatomo et al. (US 6,225,650 B1) as applied to claims 24-25, 27 and 31-32 above, and further in view of Tsujimura et al. (US 2001/0008285 A1).

Tadatomo et al. teach all mentioned in the rejection above. However, Tadatomo et al. fail to teach the Group III-V compound semiconductor layer comprising a nitride semiconductor including a Group III element. Tsujimura et al. teach a Group III-V compound semiconductor layer comprising a nitride semiconductor including a Group III element (page 4, paragraph [0051]). Since Tadatomo et al. and Tsujimura et al. are from the same field of endeavor (GaN semiconductor devices), the purpose disclosed by Tsujimura et al. would have been recognized in the pertinent art of Tadatomo et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the semiconductor layered structure of Tadatomo et al. by incorporating the Group III-V compound semiconductor layer of Tsujimura et al. to obtain a high reliability semiconductor device (page 4, paragraph [0053]).

Claims 28-29 and 35-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tadatomo et al. (US 6,225,650 B1) as applied to claims 24-25, 27 and 31-32 above, and further in view of Kimura et al. (US 6,420,198 B1).

Art Unit: 2822

Tadatomo et al. teach all mentioned in the rejection above. However, Tadatomo et al. fail to teach an opening of the mask having a stripe-shape with a longitudinal direction in the range of  $-10$  degrees to  $+10$  degrees from  $[1-100]$  and  $[11-20]$  of the base. Kimura et al. teach an opening of the mask having a stripe-shape with a longitudinal direction in the range of  $-5$  degrees to  $+5$  degrees (which is in the range of  $-10$  degrees to  $+10$  degrees) from  $[1-100]$  and  $[11-20]$  of the base (col. 6, lines 19-42). Since Tadatomo et al. and Kimura et al. are from the same field of endeavor (GaN semiconductor devices), the purpose disclosed by Kimura et al. would have been recognized in the pertinent art of Tadatomo et al. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify the semiconductor layered structure of Tadatomo et al. by incorporating the stripe-shape mask opening of Kimura et al. to obtain stripe masks resulting in highly flat side walls (col. 5, lines 54-67).

### ***Allowable Subject Matter***

Claims 30 and 37 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

### ***Conclusion***

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patents are cited to further show the state of the art with respect to semiconductor layered structures:

Ikeda (US 6,312,967 B1)

Motoki et al. (US 6,413,627 B1)

Sugiura et al. (6,015,979)

Tsuda et al. (US 6,294,440 B1)


Usui et al. (US 6,252,261 B1).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Ida M Soward whose telephone number is 703-305-3308. The examiner can normally be reached on Monday - Thursday, 6:30 am to 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on 703-308-4905. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9318.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

ims  
November 22, 2003

  
AMIR ZARABIAN  
SENIOR PATENT EXAMINER  
TECHNOLOGY CENTER 2800